5-B-61

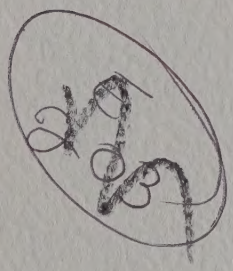
PRICE $5.00

POWER SUPPLY

VOLTAGE REGULATED
POWER SUPPLY

MODELS SM 75-8
AND SM 75-8M

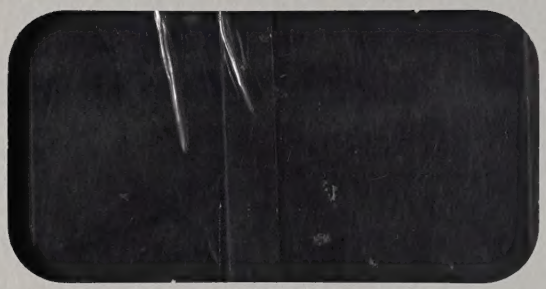
SERIAL NO. C-22487



INSTRUCTION MANUAL

kepco®

131-38 SANFORD AVENUE • FLUSHING, N. Y. 11352
Area Code 212 IN 1-7000 • TWX # 212-539-6623



SERIES CONNECTION

Kepco Voltage Regulated Power Supplies can be connected in series for increased voltage, provided the specified limits on the voltage to chassis are not exceeded. When series connected, supplies should be protected by means of a semiconductor diode, reverse-connected across the output terminals of each power supply. The peak reverse voltage (PRV) rating of this diode should be chosen to be at least as large as the voltage rating of the supply to which it is connected. The forward (continuous) current rating of the diode should be capable of carrying the largest short circuit current of the series inter-connected supplie

INSTRUCTION MANUAL

VOLTAGE REGULATED
POWER SUPPLY

MODELS SM 75-8
AND SM 75-8M

SERIAL NO. C-22487

The Kepco equipment described in this instruction manual is of proprietary design, covered by one or more of the following United States patents, or by patents pending:

2,992,379	3,092,757
2,992,386	3,112,439
3,028,538	3,128,423
3,056,905	3,131,344
3,088,053	

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PB:is
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REFERENCE INDEX

Parts Lists

Schematic Diagrams of Power and Control Units

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https://archive.org/details/manualsplus_08421

I. ELECTRICAL AND PHYSICAL SPECIFICATIONS

. . . . DC OUTPUT:

0-75 volts; continuously variable output control.

0-8 amperes, continuous duty.

. . . . AC INPUT:
105-125 volts, 60 ± 1/2 cps; 10. 2 amperes, maximum.

. . . . REGULATION -

- LINE: Within 0. 1% of the output voltage setting in the specified range for line change of 105-125 v ac.

- LOAD: Within 0. 1% of the output voltage setting in the specified range, or 0. 003 v, whichever is greater, for load change of 0-8 amperes. REMOTE ERROR SENSING feature provides means of maintaining specified regulation directly at load. (See Section C)

. . . . RIPPLE:
Less than 0. 001 volt rms.

. . . . STABILITY:
Output voltage variation is less than 0. 1% or 0. 006 v, whichever is greater, over a period of 8 hours after unit has reached equilibrium. Approximately 3/4 hour is required for this unit to reach equilibrium from a "cold start".

. . . . OUTPUT IMPEDANCE:
Less than 0. 01 ohm from DC to 1 KC.
Less than 0. 1 ohm from 1 KC to 100 KC.

. . . . RECOVERY TIME:
50 microseconds; defined as the time required for the output voltage to return to within 0. 1 volt of the output voltage setting.

. . . . TEMPERATURE COEFFICIENT:
Output voltage changes less than 0. 05% per unit C.

. . . . AMBIENT OPERATING TEMPERATURE:
-20 C to +50 C maximum. Protective circuit turns off unit whenever over-temperature condition occurs in pass elements. Interrupting input power resets unit.

. . . . STORAGE TEMPERATURE:
-40 C to +85 C.

.... DIMENSIONS:
Height 8-3/4", Width 19", Depth 13-7/8" behind panel.

.... COLOR:
Kepco Standard Gray Hammertone.

.... PANEL METERS: (applies only to Model SM 75-8M)
Voltmeter: 0-80 volts, 2-1/2".
Ammeter: 0-8 amperes, 2-1/2".

II. TERMINALS AND CONTROLS -

- ON FRONT PANEL:

.... DC OUTPUT and GROUND binding posts, clearly marked. Output terminals isolated from chassis; either positive or negative terminal may be grounded.

.... VOLTAGE CONTROL, continuously variable, for setting output voltage.

.... POWER ON-OFF SWITCH.

- AT REAR OF UNIT:

.... DC OUTPUT and GROUND binding posts, clearly marked; connected internally to respective front panel binding posts.

.... REMOTE ERROR SENSING binding posts provide means of connecting output to maintain specified regulation directly at remote load terminals. (See Section C)

III. PROTECTIVE FEATURES -

.... POWER INPUT FUSE (ac) on front panel.

.... DC OUTPUT FUSE on front panel.

.... REFERENCE FUSE (ac) for internal circuitry.

.... OVERLOAD PROTECTION:
Inherent current limiting action of Kepco "FLUX-O-TRAN" transformer permits momentary short circuit of output without damage to unit. Continuous overload or short circuit will open the DC OUTPUT FUSE.

.... OVER-TEMPERATURE PROTECTION:
Thermostat relay control turns unit OFF if temperature of PASS elements exceeds safe limit. Relay is reset by interrupting input power with ON-OFF switch on front panel, or by disconnecting line cord from power source.

SECTION B

BRIEF THEORY:

Two circuit schematic drawings titled "POWER UNIT" and "CONTROL UNIT" are included in the Reference Index of this instruction manual. These drawings contain designations corresponding to the capitalized terms in the following discussion.

Some basic functional relationships in this power supply are illustrated in block Diagram B-1 (Page B-2A).

The POWER UNIT includes:

DC SOURCES:

....MAIN SUPPLY - (consisting of a Kepco "Flux-O-Tran" transformer, full wave bridge rectifier, and capacitive filter) provides line regulated DC power for the output, via the PASS CIRCUITRY.

....AUXILIARY SUPPLIES: COLLECTOR SUPPLY (negative full wave rectified) for PASS CIRCUITRY driver stages not connected to MAIN SUPPLY; I_{CO} SUPPLY (full wave rectified) compensates for spurious biasing effects of collector leakage current; RETURN SUPPLY (full wave rectified) acts as leakage current path for series pass transistors and as bleed path to provide minimum operating current for pass transistors; CONTROL UNIT SUPPLY (full wave rectified).

PASS CIRCUITRY:

The power transistors which function as pass elements (i.e. are in series with the load) may be regarded effectively as variable resistors (or conductors) controlled by a CONTROL SIGNAL. The current "passed" by these elements is a function of the emitter-base bias. The CONTROL SIGNAL is applied to the base terminal; hence a negative CONTROL SIGNAL will aid the forward conduction of a PNP transistor while a positive CONTROL SIGNAL will reduce the forward conduction. In response to the CONTROL SIGNAL the pass elements effect a current and voltage distribution in the main DC loop which holds the output voltage constant.

The CONTROL UNIT includes:

REFERENCE CIRCUITRY:

The function of the REFERENCE CIRCUITRY is to maintain a precise, stable, voltage standard for the COMPARISON AMPLIFIER.

COMPARISON AMPLIFIER:

The COMPARISON AMPLIFIER is essentially a series of cascaded transistor amplifiers which boost the differential error signal produced in the COMPARISON BRIDGE to a level sufficient to drive the PASS CIRCUITRY. The COMPARISON AMPLIFIER is connected across the COMPARISON BRIDGE from the junction of the VOLTAGE CONTROL and the REFERENCE RESISTANCE to the junction of the REFERENCE DIODE and the negative output terminal (See Diagram on Page B-2A). This arrangement is similar to that of a null galvanometer across a Wheatstone bridge. Unbalance in the COMPARISON BRIDGE is amplified to produce a CONTROL SIGNAL of suitable magnitude and phase to effect corrective action by the PASS CIRCUITRY.

COMPARISON BRIDGE: (See Diagram B-2, Page B-2A).

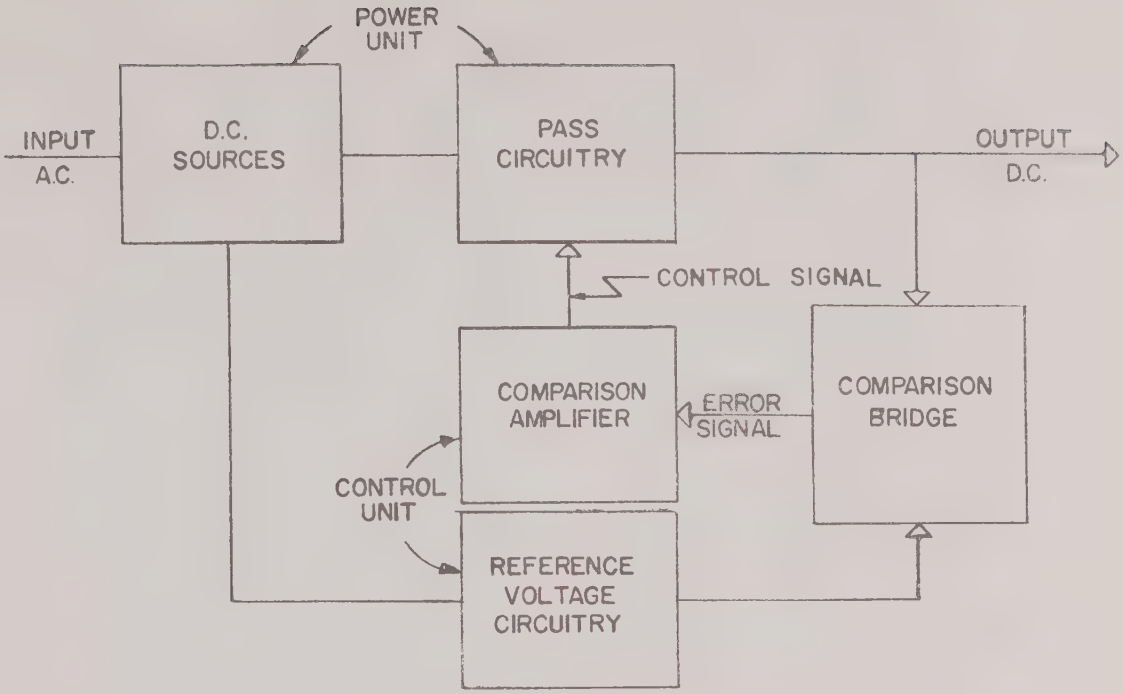
This bridge circuit implements the comparison between the OUTPUT VOLTAGE and the REFERENCE VOLTAGE. The signal produced by the comparison drives the COMPARISON AMPLIFIER.

Balance occurs in the Comparison Bridge when the following ratios are equal:

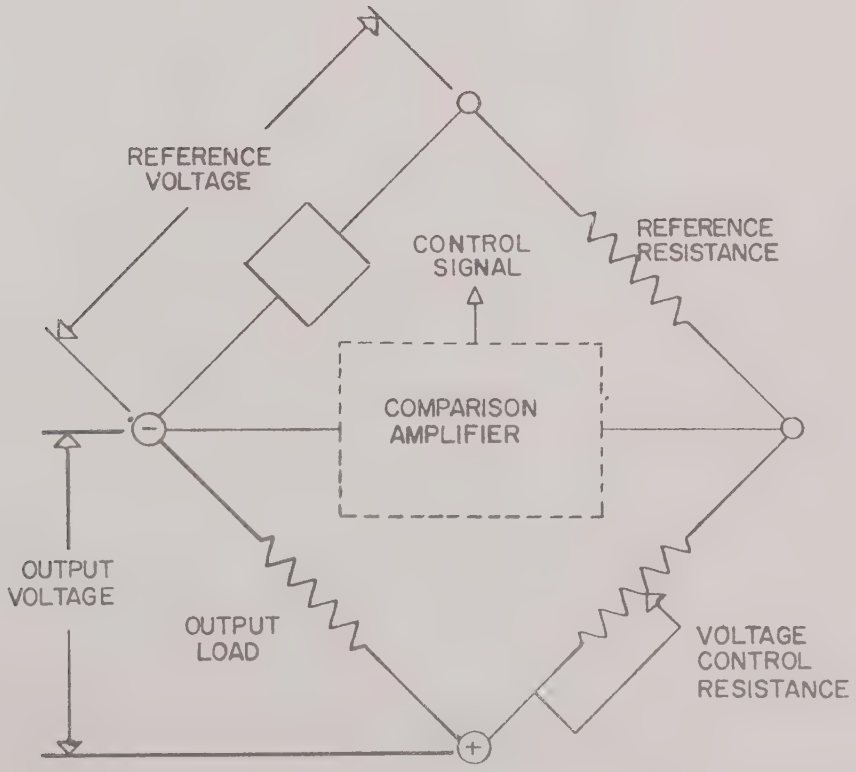
$$\frac{\text{Output Voltage}}{\text{Voltage Control Resistance}} = \frac{\text{Reference Voltage}}{\text{Reference Resistance}}$$

When, for example, the Comparison Bridge is unbalance by a decreasing output voltage drop across the load, it gives rise to a negative signal at the base of the COMPARISON FOLLOWER in the COMPARISON AMPLIFIER circuit. This signal is amplified in cascade and communicated to the pass elements as a negative base input aiding their forward conduction and consequently increasing the output voltage.

A bridge unbalance caused by an increasing output voltage produces, of course, a chain of oppositely biased circuit responses which reduce the voltage across the load.



(DIAGRAM B-1) *VOLTAGE REGULATED POWER SUPPLY*



(DIAGRAM B-2) *COMPARISON BRIDGE*

This power supply is shipped without any internal packing material; and may be put into operation immediately. It is designed for rack and for bench use. Carrying handles are provided on front panel.

....INTIAL "TURN - ON" PROCEDURE:

1. Adjust VOLTAGE CONTROL to approximate mid-range position.
2. With POWER ON-OFF switch set in "OFF" position, connect line cord to 115 v ac, 60 cps input power. If outlet is not polarized use 3 to 2 - prong adapter supplied with unit.
3. Set POWER ON-OFF switch to "ON" position.
4. Adjust VOLTAGE CONTROL to obtain desired output voltage.

....GENERAL OPERATION:

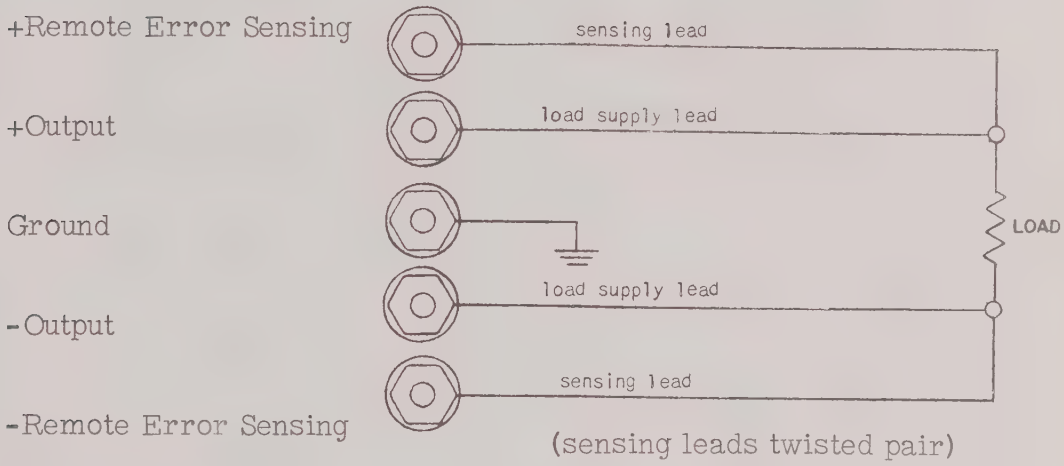
1. Once it has been determined that the unit is functioning satisfactorily, it is subsequently unnecessary to follow the INITIAL TURN-ON PROCEDURE.
2. The VOLTAGE CONTROL may be left fixed at any setting and the power turned "ON" and "OFF" without any harmful effects.

....MAINTENANCE AND REPAIR:

1. Under normal operating conditions, no mechanical maintenance of any kind should be required. Conservatively rated electrical components assure long trouble-free operating life.
2. Exceptional component accessibility, provided by resistor board construction and plug-in sub-assemblies, facilitates servicing, should it be required. It is emphatically recommended that trouble-shooting be handled by personnel highly familiar with transistor circuitry, - preferably with experience in closed-loop designs.
3. This unit should not be returned to the manufacturer without proper authorization and shipping instructions. In any correspondence with the factory regarding repair, the model, serial number, and symptoms of malfunction must be included.

REMOTE ERROR SENSING OPERATION

(Terminal Connections)



(Procedure)

1. With AC input power disconnected, remove jumpers between plus and minus Output terminals and Remote Error Sensing terminals on the rear of the unit.

2. Using twisted pair wire, connect sensing leads from positive and negative Remote Error Sensing terminals to the load (observing polarities).

3. Using twisted pair wire, connect load supply leads from positive and negative Output terminals.

IMPORTANT NOTE: This unit should not be operated with Remote Error Sensing if the voltage drop across the load supply leads exceeds 0.5 volt (maximum) per lead at maximum rated output current.

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
B201	149-0013	Fan, Venturi		Rotron	Muffin Fan
		Capacitors:			
C201	117-0243	Electrolytic, Can	4 K uf 125 v +100-10%	Industrial Cond.	10B961
C202, 203	117-0243	Electrolytic, Can	4 K uf 125 v +100-10%	Industrial Cond.	10B961
C204	117-0280	Paper, Can	8 uf 660 v 5%	Industrial Cond.	2465-SVR
C502	117-0068	Mylar	0.1 uf 600 v 20%	Good-All	620S10406W
C206	117-0129	Mylar	2 uf 200 v 10%	Hopkins	2P2M
C301	117-0163	Ceramic	.05 uf 200 v 20%	Sprague	36C142A1
C302	117-0147	Electrolytic, Pigtail	10 uf 150 v +50-10%	Industrial Cond.	10B912RM
C401	117-0114	Electrolytic, Pigtail	350 uf 50 v +100-10%	Industrial Cond.	1B844
C402	117-0222	Electrolytic, Pigtail	100 uf 200 v +50-10%	Industrial Cond.	20B317RM
C403, 404	117-0221	Electrolytic, Pigtail	500 uf 50 v +100-10%	Industrial Cond.	1B1163RM
C405, 406	117-0163	Ceramic	0.05 uf 500 v 20%	Sprague	36C142A1
C501	117-0074	Electrolytic, Pigtail	20 uf 250 v +50-10%	Industrial Cond.	25RM20
		Rectifiers:			
CR201	124-0088	Silicon, Stack		Trans-Sil	3S1136
CR301, 302	124-0028	Silicon, Pigtail		Automatic	PT-5
CR401, 402 405-408	124-0084	Silicon, Pigtail		Transitron	SL-91
CR403, 404	124-0028	Silicon, Pigtail		Automatic	PT-5
F101	141-0010	Fuse, Instantaneous	15 A	Bussman	ABC-15
F102	141-0037	Fuse, Slow Blow	15 A	Bussman	MDL-15
F401	141-0012	Fuse, Instantaneous	2 A	Bussman	AGC-2
M101	135-0189	Meter	80 V DC 2-1/2 v	G.E.	8DW91
M102	135-0195	Meter	8 A DC 2-1/2 v	G.E.	8DW91

(appl. only to SM 75-8M & SM 75-8MX)

PARTS LIST - MODEL SM 75-8, SM 75-8X

POWER UNIT DRAWING NUMBER CM00394

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
PL101	153-0024	Pilot Light		G. E.	NE-51
Q301	119-0022	Transistor, PNP		Tung-Sol	2N382
Q302	119-0034	Transistor, PNP		Delco	2N1172
		Resistors:			
R201	115-0513	Fixed, Power, Strip	1 K ohms 40 w 5%	Ward Leonard	40S1000
R202	115-0725	Fixed, Power, Strip	5 ohms 20 w 5%	Ward Leonard	20S5WL
R203	115-0967	Fixed, Power, Strip	20 ohms 20 w 5%	Ward Leonard	20S20WL
R204	115-0201	Fixed, Power, Strip	500 ohms 40 w 5%	Ward Leonard	40S500
R205	115-0232	Fixed, Power, Axial	5 K ohms 5 w 5%	Ward Leonard	5X5000
R206-208	115-1017	Fixed, Power, Ribbon	0.25 ohms 40 w 5%	Hardwicke Hindle	HH2B-35-0.3 ohm-5%EW
R210, 211	115-0718	Fixed, Molded	47 ohms 1/2 w 10%	Allen Bradley	EB4701
R209	115-0894	Variable, Wire Wound	10 K ohms 2.5 w 5%	General Radio	973-N
R301	115-0875	Fixed, Power, Axial	40 ohms 3 w 5%	Ward Leonard	3X40
R302	115-0470	Fixed, Molded	220 ohms 1/2 w 5%	Allen-Bradley	EB2215
R303	115-0350	Fixed, Molded	4.7 K ohms 1/2 w 5%	Allen-Bradley	EB4725
R304	115-0066	Fixed, Molded	1 K ohms 1 w 10%	Allen-Bradley	GB1021
R305	115-0905	Fixed, Power, Axial	200 ohms 5 w 5%	Ward Leonard	5X200
R306	115-0666	Fixed, Molded	22 ohms 1/2 w 10%	Allen-Bradley	EB2201
R307	115-0253	Fixed, Molded	82 K ohms 1/2 w 5%	Allen-Bradley	EB8235
R308	115-0512	Fixed, Power, Axial	1 K ohms 5 w 5%	Ward Leonard	5X1000WL
R309	115-0809	Fixed, Molded	100 K ohms 1/2 w 10%	Allen-Bradley	EB1041
RL201	140-0040	Relay, Plug-In	3 PDT	Kurman	26D3C
S101	127-0107	Switch, Toggle	SPST	Carling	AA252-71-2

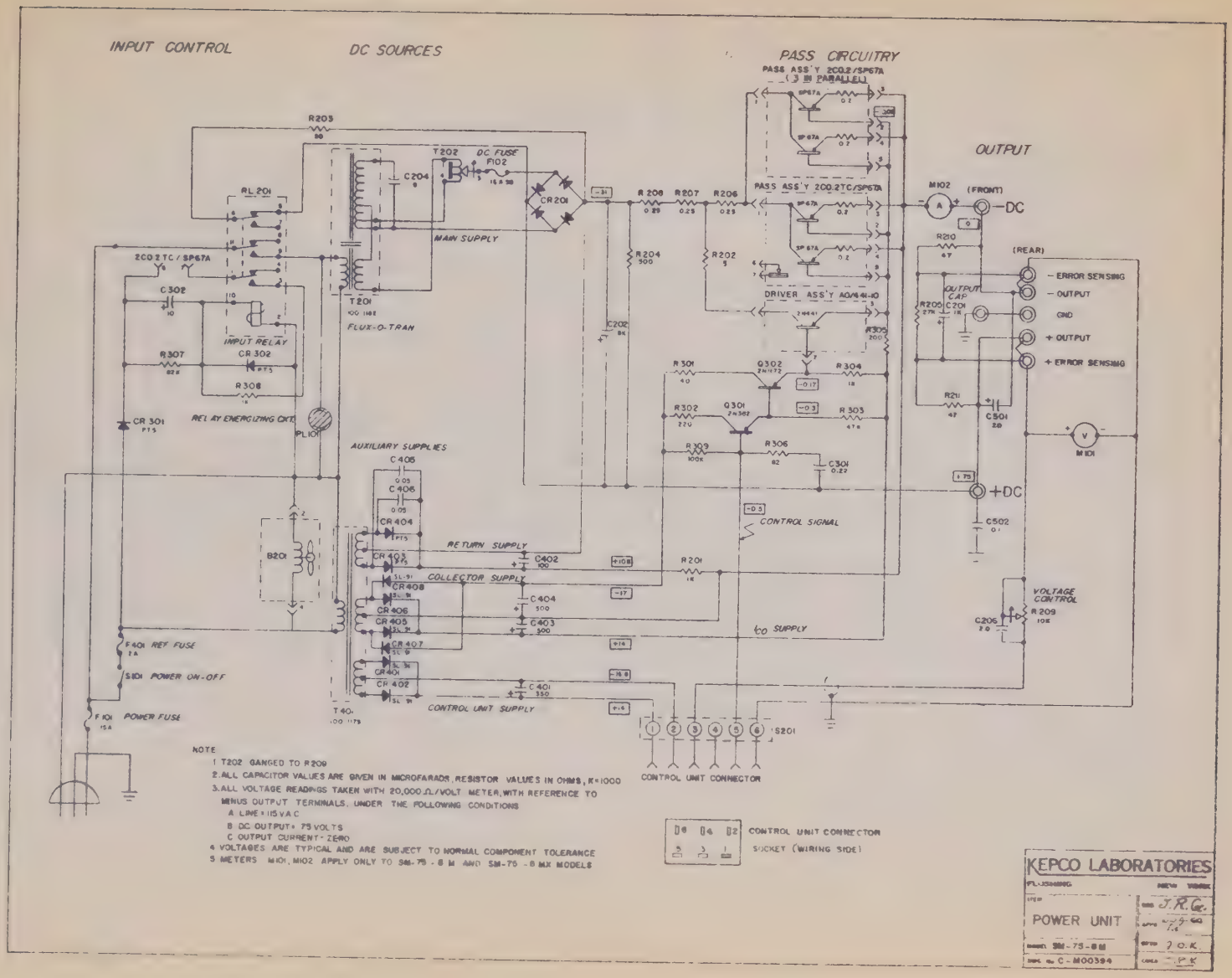
Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
T201	100-1182	Transformer, Flux-O-Tran		Kepco Magnetics	100-1182
T202	175-0398	Transformer, Variable		Superior	Q117U
T401	100-1179	Transformer		Kepco Magnetics	100-1179
2C0.2/SP67A	110-0117	PASS ASSEMBLY (STAT) Includes the following:			
2 ea.	115-0891	Resistor, fixed, power, axial	0.2 ohms 5 w 5%	Ward Leonard	7/8"-Y-0.2-Axiohm-5%
2 ea.	119-0036	Transistor, PNP		Motorola	SP67A *
2C0.2TC/SP67A	110-0119	PASS ASSEMBLY (STAT) Includes the following:			
2 ea.	115-0891	Resistor, Fixed, power, axial	0.2 ohms 5 w 5%	Ward Leonard	7/8"-Y-0.2-Axiohm-5%
1 ea.	127-0093	Switch, Thermostat	NC	Chatham	DRSCORP73C
2 ea.	119-0036	Transistor, PNP		Motorola	SP67A*
A0/441-10	110-0114	PASS ASSEMBLY (STAT) Includes the following:			
1 ea.	119-0016	Transistor, PNP		Delco	2N441-10**

* = Field Replacement: Motorola 2N1165

** = This is Delco Type 2N441 tested and selected by Kepco to our specification 2N441-10

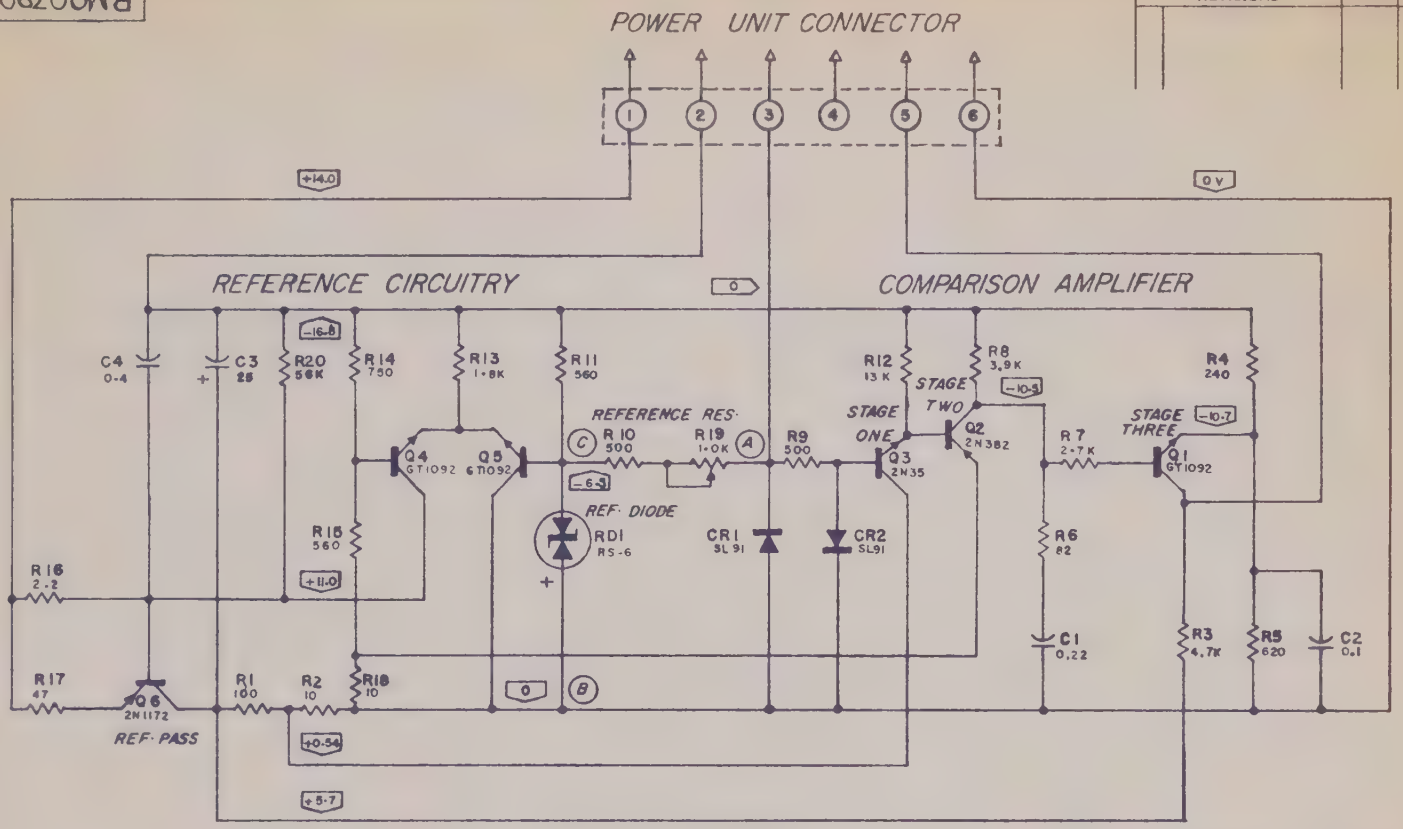
Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
		Capacitors:			
C1	117-0107	Mylar	0.22 µf 200 v 20%	Good-All	620S22402W
C2	117-0087	Ceramic	0.1 µf 500 v + 80, -20%	Sprague	41C92
C3	117-0105	Electrolytic, Pigtail Type	25 µf 25 v +100, -10%	Industrial Cond.	1B1063
C4	117-0128	Mylar	0.4 µf 200 v 10%	Hopkins Eng.	P42MK
CR1, 2	124-0084	Rectifier, Silicon, Pigtail Type		Transitron	SL-91
Q1, 4, 5	119-0024	Transistor, NPN		Gen. Transistor	GT1092
Q2	119-0022	Transistor, PNP		Tung-Sol	2N382
Q3	119-0007	Transistor, NPN		Gen. Transistor	2N35
Q6	119-0034	Transistor, PNP		Delco	2N1172
		Resistors:			
R1	115-0002	Fixed, Molded	100 Ω 1 w 10%	Allen-Bradley	GB1011
R2	115-0502	Fixed, Molded	10 Ω 1/2 w 10%	Allen-Bradley	EB1001
R3	115-0467	Fixed, Molded	4.7K Ω 1/2 w 10%	Allen-Bradley	EB4721
R4	115-0484	Fixed, Molded	240 Ω 1/2 w 5%	Allen-Bradley	EB2415
R5	115-0565	Fixed, Molded	620 Ω 1/2 w 5%	Allen-Bradley	EB6215
R6	115-0941	Fixed, Molded	82 Ω 1/2 w 10%	Allen-Bradley	EB8201
R7	115-0560	Fixed, Molded	2.7K Ω 1/2 w 10%	Allen-Bradley	EB2721
R8	115-0808	Fixed, Molded	3.9K Ω 1/2 w 5%	Allen-Bradley	EB3925
R9, 10	115-0459	Fixed, Power, Axial	500 Ω 3 w 5%	Ward Leonard	3X500
R11, 15	115-0888	Fixed, Molded	560 Ω 1/2 w 5%	Allen-Bradley	EB5615

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
		Resistors:			
R12	115-0920	Fixed, Molded	13 K Ω 1/2 w 5%	Allen-Bradley	EB1335
R13	115-0473	Fixed, Molded	1.8 K Ω 1/2 w 10%	Allen-Bradley	EB1821
R14	115-0566	Fixed, Molded	750 Ω 1/2 w 5%	Allen-Bradley	EB7515
R16	115-0466	Fixed, Molded	2.2 K Ω 1/2 w 10%	Allen-Bradley	EB2221
R17	115-0005	Fixed, Molded	47 Ω 1 w 10%	Allen-Bradley	GB4701
R18	115-0052	Fixed, Molded	10 Ω 1 w 10%	Allen-Bradley	GB1001
R19	115-0739	Variable, Multiturn	1 K Ω 1/4 w 10%	Bourns	271-1-102
R20	115-0255	Fixed, Molded	56 K Ω 1/2 w 10%	Allen-Bradley	EB5631
RD1	121-0013	Reference Diode		Hoffman	RS-6


INPUT CONTROL
DC SOURCES
PASS CIRCUITRY
OUTPUT
PASS ASS'Y 2C02/SP67A (3 IN PARALLEL)
PASS ASS'Y 2C02TC/SP67A
DRIVER ASS'Y AQ/4141-10
R203
T202
DC FUSE F102
C204
CR201
RL201
2C02TC/SP67A
C302
INPUT RELAY
CR302
R307
R308
CR301
RELAY ENERGIZING CKT
P101
MAIN SUPPLY
T201
FLUX-O-TRAN
R208
R207
R206
R204
R202
C202
R305
R301
Q302
R304
R302
Q301
R303
R309
R306
C301
M102
(FRONT)
-DC
R210
(REAR)
- ERROR SENSING
- OUTPUT
GND
+ OUTPUT
+ ERROR SENSING
OUTPUT CAP
R208
C201
R211
C501
M101
+DC
C502
CONTROL SIGNAL
AUXILIARY SUPPLIES
C405
C406
CR404
CR403
CR408
CR406
CR405
CR407
CR401
CR402
B201
RETURN SUPPLY
COLLECTOR SUPPLY
CONTROL UNIT SUPPLY
C402
C404
C403
C401
R201
VOLTAGE CONTROL
R209
C206
to SUPPLY
F401 REF FUSE
S101 POWER ON-OFF
F101 POWER FUSE
T401
S201
CONTROL UNIT CONNECTOR
CONTROL UNIT CONNECTOR SOCKET (WIRING SIDE)
NOTE
1 T202 GANGED TO R209
2 ALL CAPACITOR VALUES ARE GIVEN IN MICROFARADS, RESISTOR VALUES IN OHMS, K=1000
3 ALL VOLTAGE READINGS TAKEN WITH 20,000 Ω/VOLT METER, WITH REFERENCE TO MINUS OUTPUT TERMINALS, UNDER THE FOLLOWING CONDITIONS
A LINE=115 VAC
B DC OUTPUT=75 VOLTS
C OUTPUT CURRENT=ZERO
4 VOLTAGES ARE TYPICAL AND ARE SUBJECT TO NORMAL COMPONENT TOLERANCE
5 METERS M101, M102 APPLY ONLY TO SM-75-8 M AND SM-75-8 MX MODELS
KEPCO LABORATORIES
POWER UNIT
SM-75-8M
C-M00394
J.R.G.
7-9-66
O.K.

BM00790

REVISIONS	DRAWN	CHKD.	APPD.	DATE



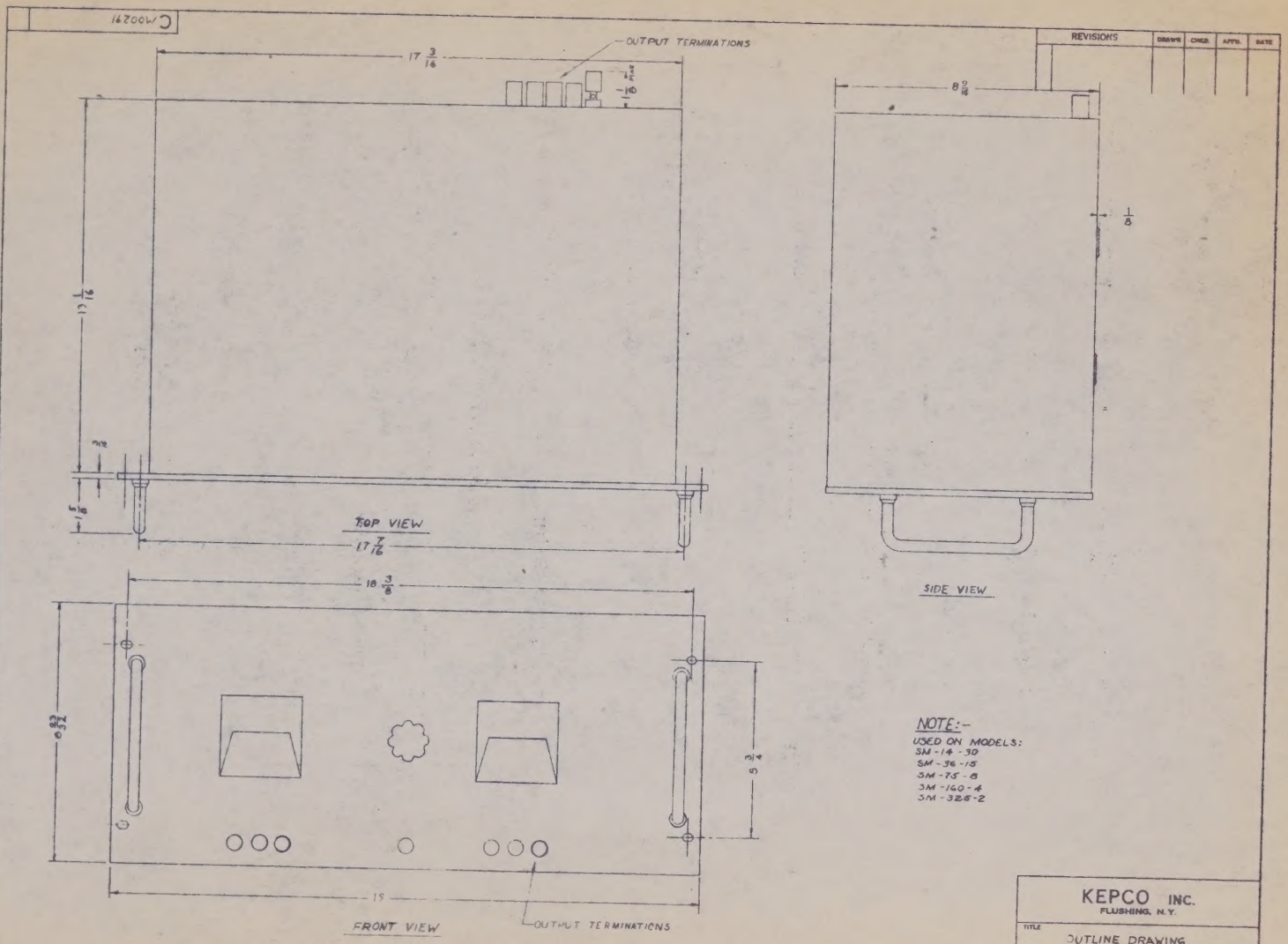
NOTES:

1- ALL VOLTAGES TAKEN UNDER CONDITIONS SPECIFIED ON MAIN SCHEMATIC

2- ALL CAPACITOR VALUES ARE GIVEN IN MICROFARADS, RESISTOR VALUES IN OHMS, UNLESS OTHERWISE NOTED (K= 1,000 OHMS)

TOLERANCE UNLESS OTHERWISE SPECIFIED: FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2°

KEPCO INC. FLUSHING, N.Y.			
TITLE: CONTROL UNIT			
DRAWN: C.A	CHECKED: S.F.K	APPROVED: [illegible]	DATE: 12-2-60
MODEL NO.: TRAM 32		PART NO.	SCALE
DWG. NO. BM00790			



NOTE:-
USED ON MODELS:
SM-14-30
SM-36-15
SM-75-8
SM-160-4
SM-325-2

KEPCO INC. FLUSHING, N.Y.			
TITLE: OUTLINE DRAWING			
DRAWN: TP	CHECKED: JPK	APPROVED:	DATE: 4-1-60
MODEL NO: SM B-3/4 SERIES		PART NO.	SCALE
DWG. NO. CM00593			

TOLERANCE UNLESS OTHERWISE SPECIFIED: FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2°

CORRECTION SHEET FOR INSTRUCTION MANUAL

MATERIAL AFFECTED

Power Unit Schematic

CORRECTION

Change the following:

1. Resistor R306, from 82 ohm to 22 ohm.
2. Resistor R205, from 27K to 5K 5w, ww, 5%.
3. Capacitor C301, from 0.22 μf, to 0.05 μf, 200 wv.
4. Capacitor C201, from 1000 μf, to 4000 μf, 125 v.

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